TAMALA LIMESTONE

The Tamala Limestone (pronounced Tar-mala) is part of the Coastal Limestone which is found along most of the coast of Western Australia, stretching from the North West Cape down the coast to Cape Leewin and then across the Great Australian Bight into South Australia. The "type section" of the rock we use for fences and in our gardens in Perth is actually up near Shark Bay, on Tamala Station, hence its name.

The rock itself is a coarse to medium-grained "calcarenite", a term implying a kind of sandy limestone, deposited as sand-dunes or in beach-nearshore environments. Most deposits represent wind-blown shell fragments, with variable amounts of quartz sand, which accumulated as coastal sand dunes during the middle and late Pleistocene and early Holocene (i.e. between at least half a million years ago and perhaps the last few thousand years). They were later turned into rock by water percolating through the shelly sands, which dissolved limey material in one place and redeposited it further on, cementing the grains together.

Of course, a rock will vary according to the environment it was deposited in. Imagine the differences you would see if the sediments in the Lancelin area, for example, were turned into rock. There would be rocks formed from huge sand dune deposits, made of layers of wind-blown shelly sand; there would be ones formed from beach deposits, with shells and seaweed; there would be fossil soils and sandy material criss-crossed by the roots of plants and small trees; and perhaps little stream-bed areas where runoff has cut across the dune or beach.

In the Tamala Limestone we have all those kinds of rock. Most have no visible fossil shells, only ground-up shell fragments, and represent sand dunes. Others have beds of many species of shelly animals, from sea-snails to clams and oysters, some obviously marine, some more fresh-water, and represent sediments laid down under water. There are even occasional fossil coral reefs.

Some of the most intriguing horizons have straight or contorted sticks and cylinders of harder material. People bring them into the Museum thinking they are specimens of fossil bone or fossil wood, but in fact they represent very lime-rich rock where the presence of a root or other plant structure has acted as a focus for the deposition of calcium carbonate from percolating waters. Often there is a hollow centre where the root has rotted away. Larger central holes, such as those left by the tap roots of large trees, can have been filled in by bits of limestone and cement to make a mould. Only very occasionally is there any actual replacement of the plant by calcium carbonate. Fossil soils are often associated with these rhizolith beds: they are generally darker grey due to carbonaceous material and may appear rubbly, and they can contain fossil land snails and perhaps the egg-shaped fossil pupal cases of weevils.

The fossil soils, calcretes and rhizolith horizons mark periods of local interruption in dune building, which allowed time for soils to develop and vegetation to become established, before being overwhelmed again by a new advancing dune. Calcretes are thought to have formed during more humid periods. The shelly horizons following on dune beds represent increases in relative sea level, when areas which were formerly near the shore of either a river or the sea became inundated. The shelly beds at Minim Cove and other localities around Perth are known to date back 130,000 years. This is a very significant date in terms of world geology: it marks a world-wide rise in sea level during an interglacial period, and matches a sea level "high" independantly calculated from the record of the Vostok ice core.

The relative sea level in the Swan Coastal Plain has been up and down like a yo-yo, even over the last 450,000 years. This can be due either to the amount of water bound up in ice during the Pleistocene glaciations which can affect the amount of water in the oceans, or to the land itself moving up and down because of Earth movements. Sometimes a continental plate can flex slightly if it is put under pressure, and sometimes it can move up or down due to a kind of buoyancy reaction, and sometimes movement on a fault can shift blocks of land up or down .

It is easy to document these changes. For example, there are peaty soils to be found in deep bore holes in the Perth area, or seashore deposits to be found far inland up against the Darling Scarp, and these can be dated. Features produced by waves cutting into cliffs can be found many miles away from the sea, and, conversely, old river valleys can be seen drowned under 150m of seawater.